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# **VIM-CRPA in West Texas**

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**Texas Department of State Health Services**



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# Objectives

- Describe the cases of VIM-CRPA in West Texas
- Summarize the containment strategy used to slow the spread of VIM-CRPA



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# Background

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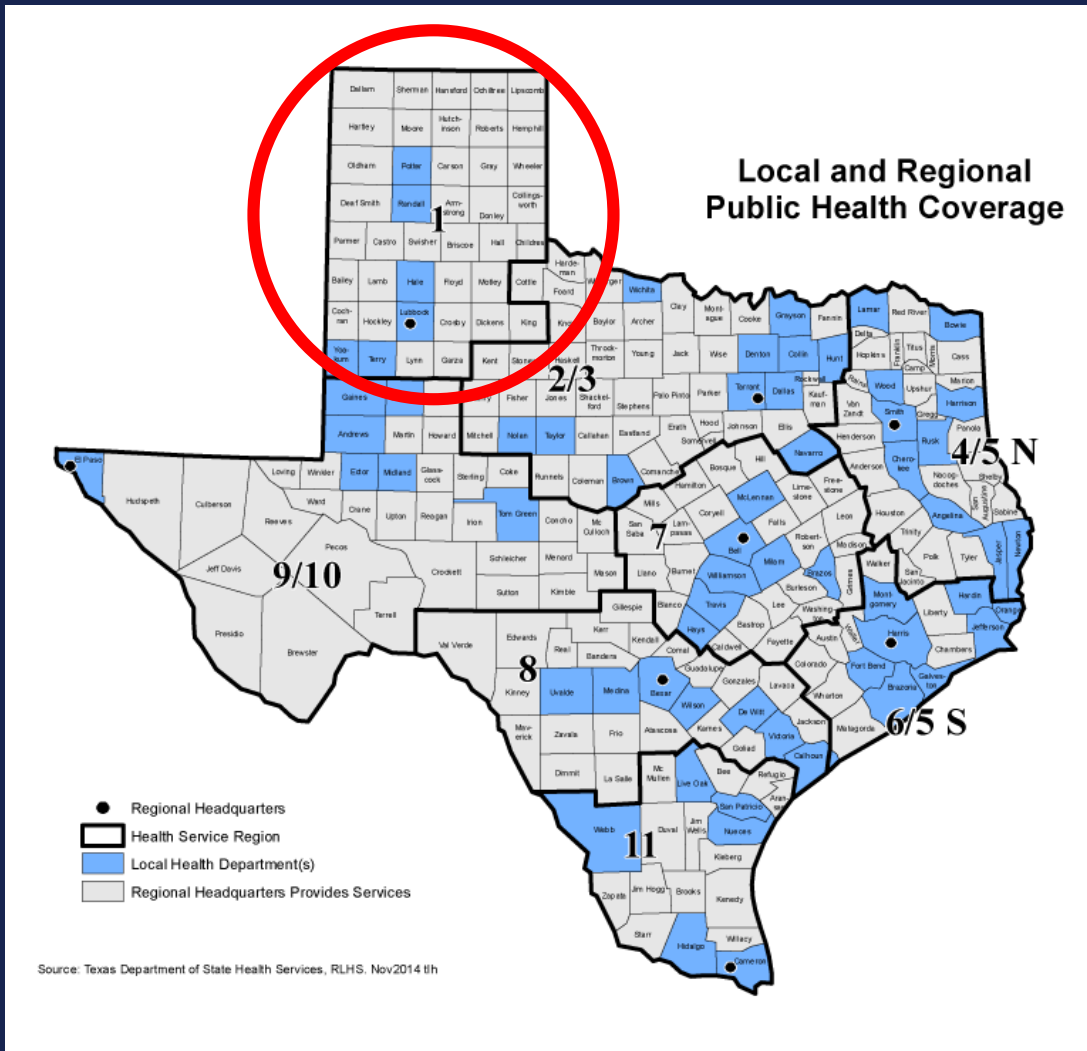
**Prior to the Epi-Aid**



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# Texas Public Health



- 254 counties
- 8 public health regions
- 64 local health departments

# Texas Notifiable Multidrug-Resistant Organisms

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- Carbapenem-resistant Enterobacteriaceae (CRE)
- Multi-drug resistant Acinetobacter (MDRA)
- Vancomycin Intermediate Staphylococcus aureus (VISA)
- Vancomycin Resistant Staphylococcus aureus (VRSA)



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Source: Texas Notifiable Conditions List

# *Pseudomonas aeruginosa*

- Gram-negative found in most environments
  - Soil, water, plants, animals
- Seen in community and hospital-acquired infections (HAIs)
  - Much more common in HAIs
  - 5th most common pathogen in all HAIs
  - 2nd most common in ventilator-associated pneumonias (VAPs)
- Admission to ICU, burns, neutropenia, or cystic fibrosis are significant risk factors



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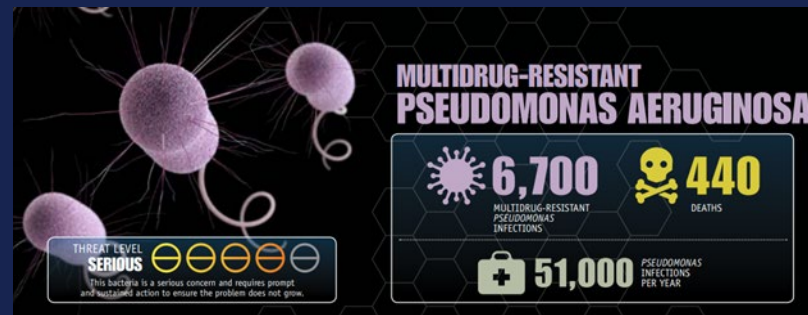
# MDRO *P. aeruginosa*

- Many resistance mechanisms exist
  - High rate of multidrug resistance compared to other organisms
- Resistance rates higher in LTACHs than ICUs
- Second most common MDRO found on healthcare workers during routine patient care (17.4%)
- Recovered in 22% of ICU rooms
- Environmental reservoirs contribute to spread
  - Water or humidity related
  - Showers, sinks, artificial nails, ultrasound gel, soap dispensers
  - Forms biofilms – prevents penetration of cleaning agents; difficult to eradicate



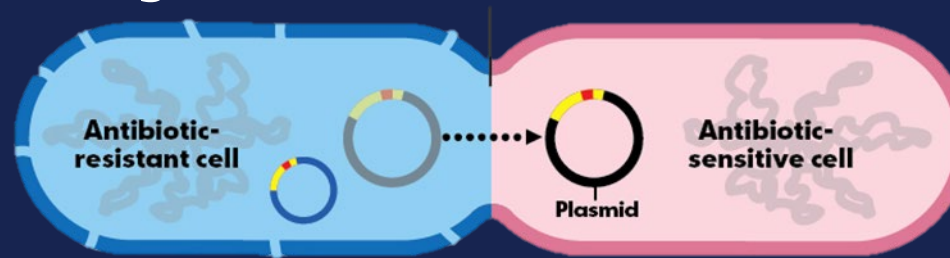
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# Carbapenemases

1. Multiple mechanisms lead to carbapenem resistance
2. Carbapenemases are enzymes that degrade carbapenem antibiotics
  - a. Often on mobile genes that can transfer to Gram-negative organisms



3. Common carbapenemases: KPC, NDM, VIM, OXA-48-type, and IMP
4. Found in Enterobacteriaceae, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*

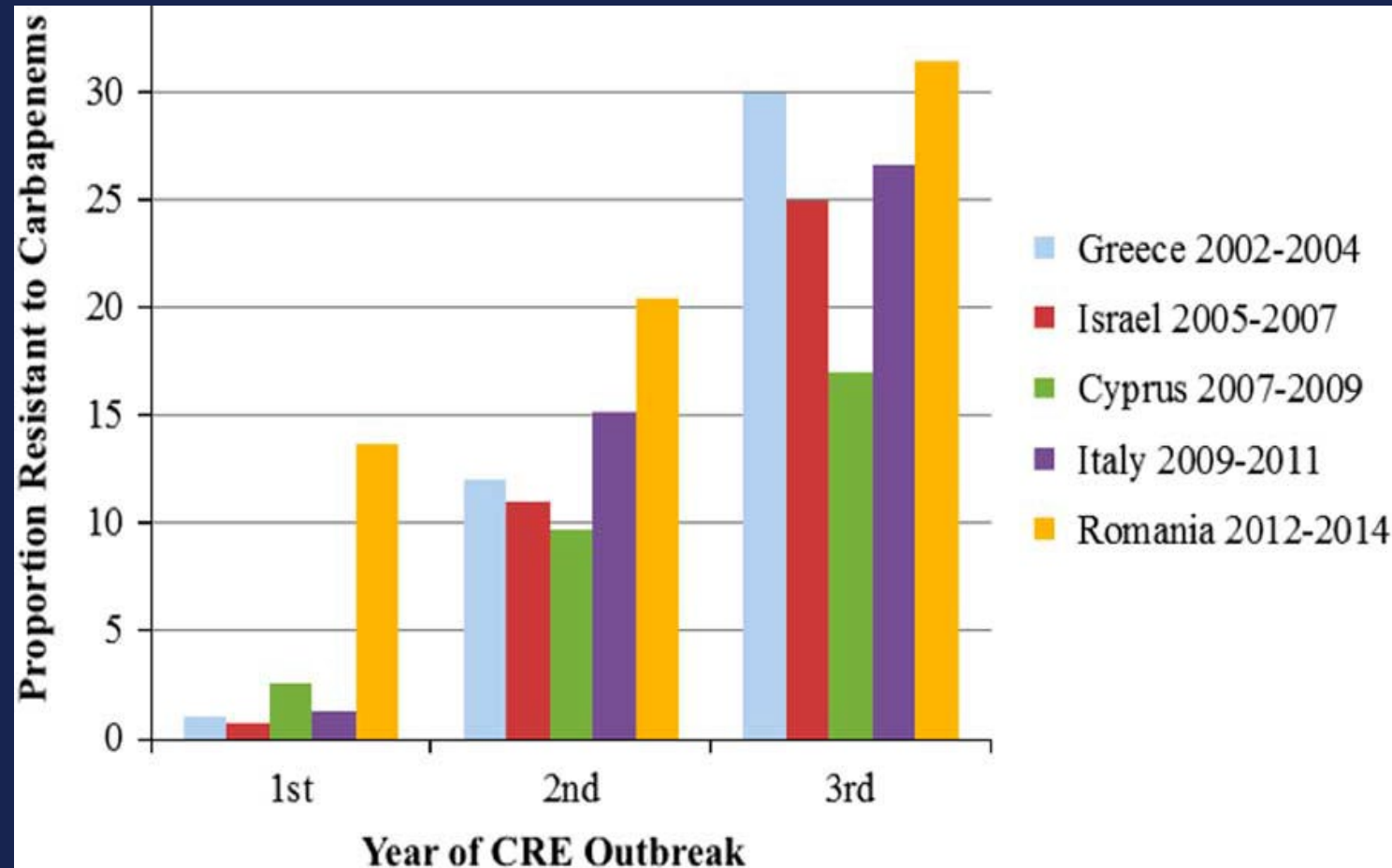


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# Carbapenemases Can Spread Rapidly



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# CDC Response Guidance

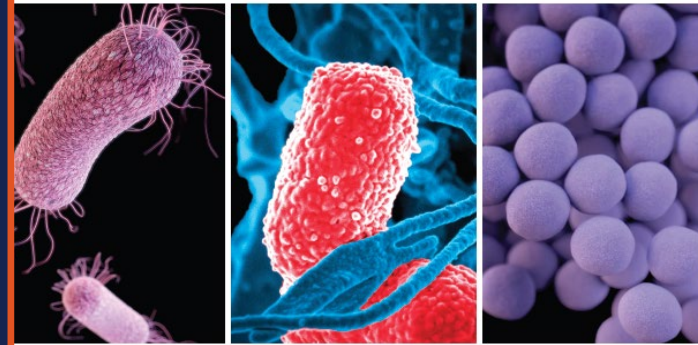
Goal:  
Slow spread of novel  
or rare multidrug-  
resistant organisms  
or mechanisms



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Interim Guidance for a Public Health Response  
to Contain Novel or Targeted Multidrug-resistant  
Organisms (MDROs)



National Center for Emerging and Zoonotic Infectious Diseases  
Office of Infectious Diseases



# Initial 4 cases identified

## Summer 2017

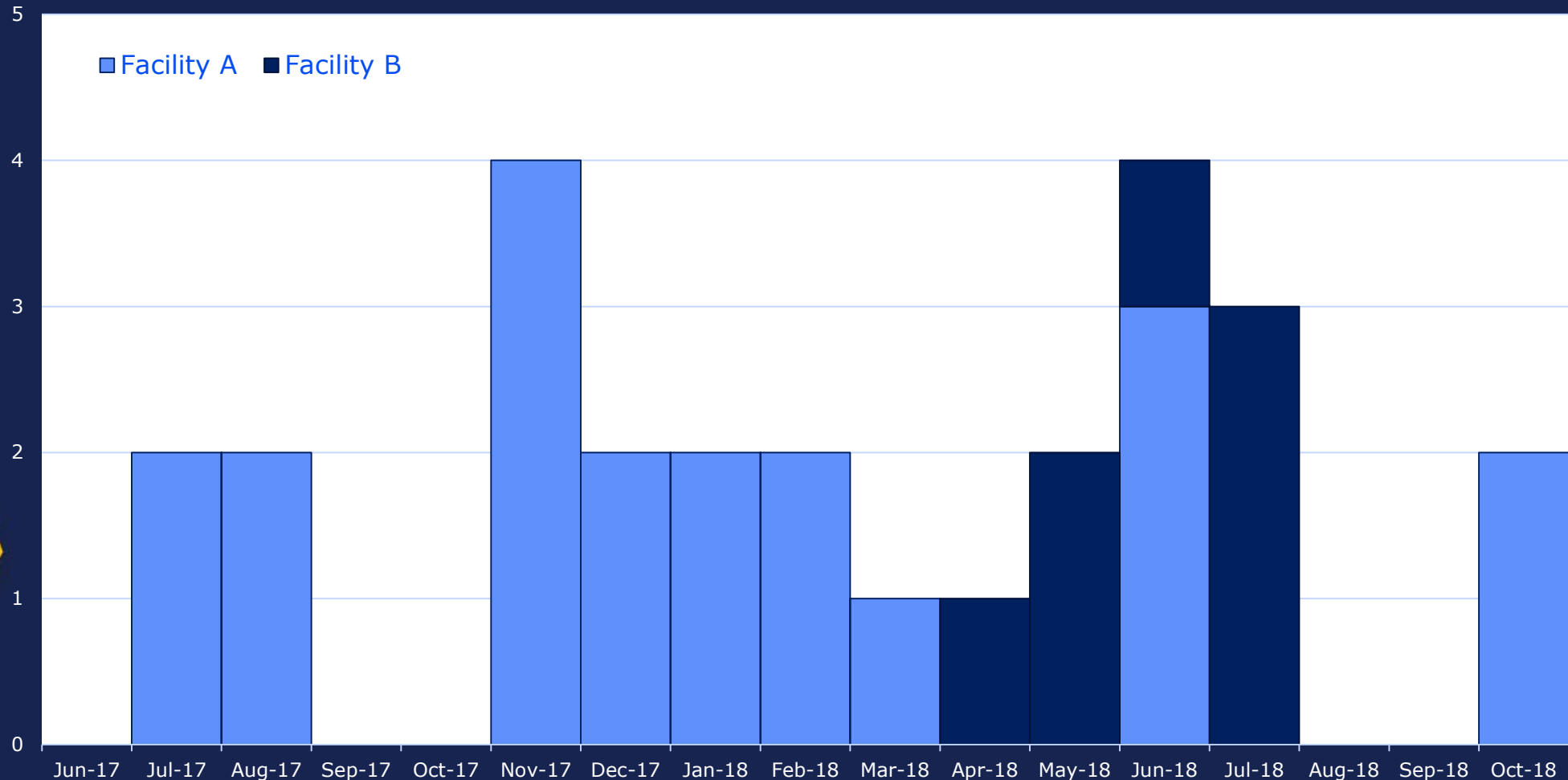


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# Epidemic Curve of VIM-CRPA

## June 2017-October 2018



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# Characteristics of West Texas VIM-CRPA

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**June 2017-October 2018**

- 27 patients
  - 1 resident of New Mexico
- 62% Male
- Median age: 63 years old
- 81% on antibiotics before culture
- 96% had an invasive procedure in the last year



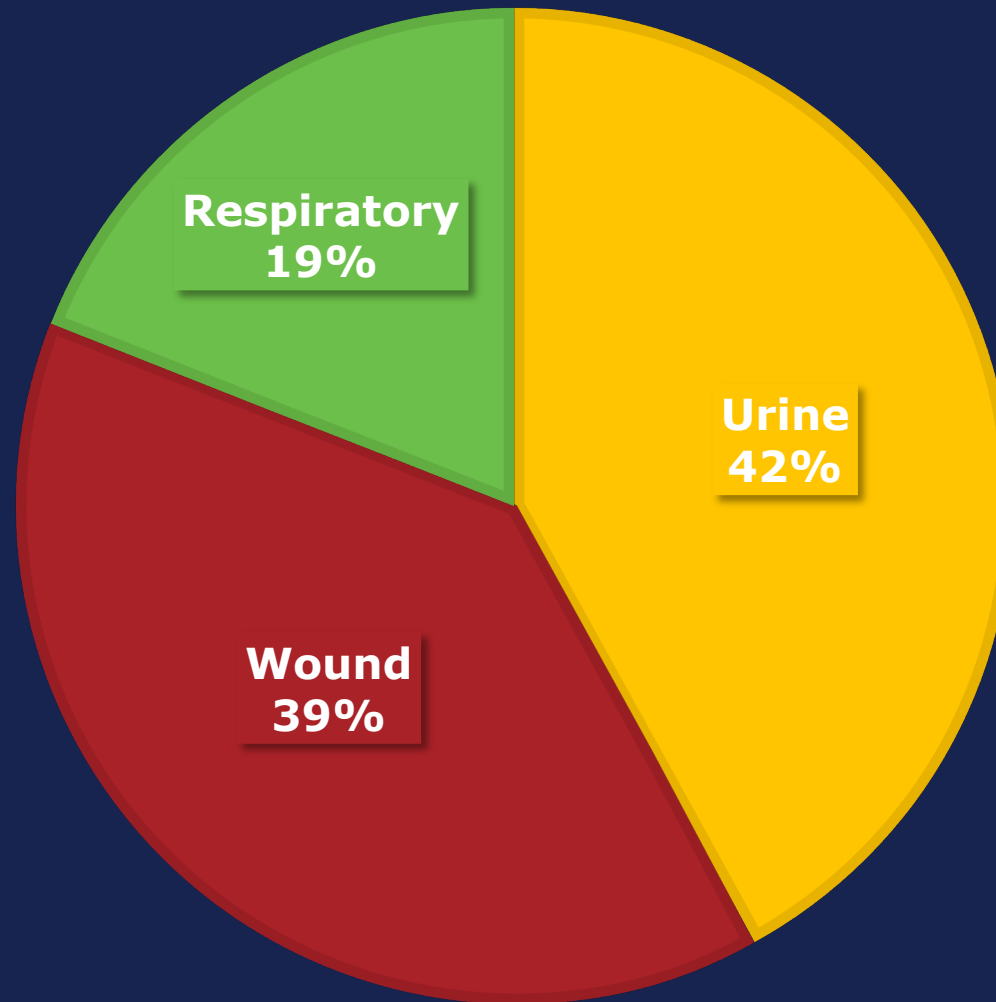
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# Specimen Sources

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# Resistance Patterns

Resistance Pattern	Number of Specimens (%)
Susceptible to colistin only	7 (27%)
Susceptible to colistin and one other class	18 (69%)
Susceptible to colistin and two other classes	1 (4%)

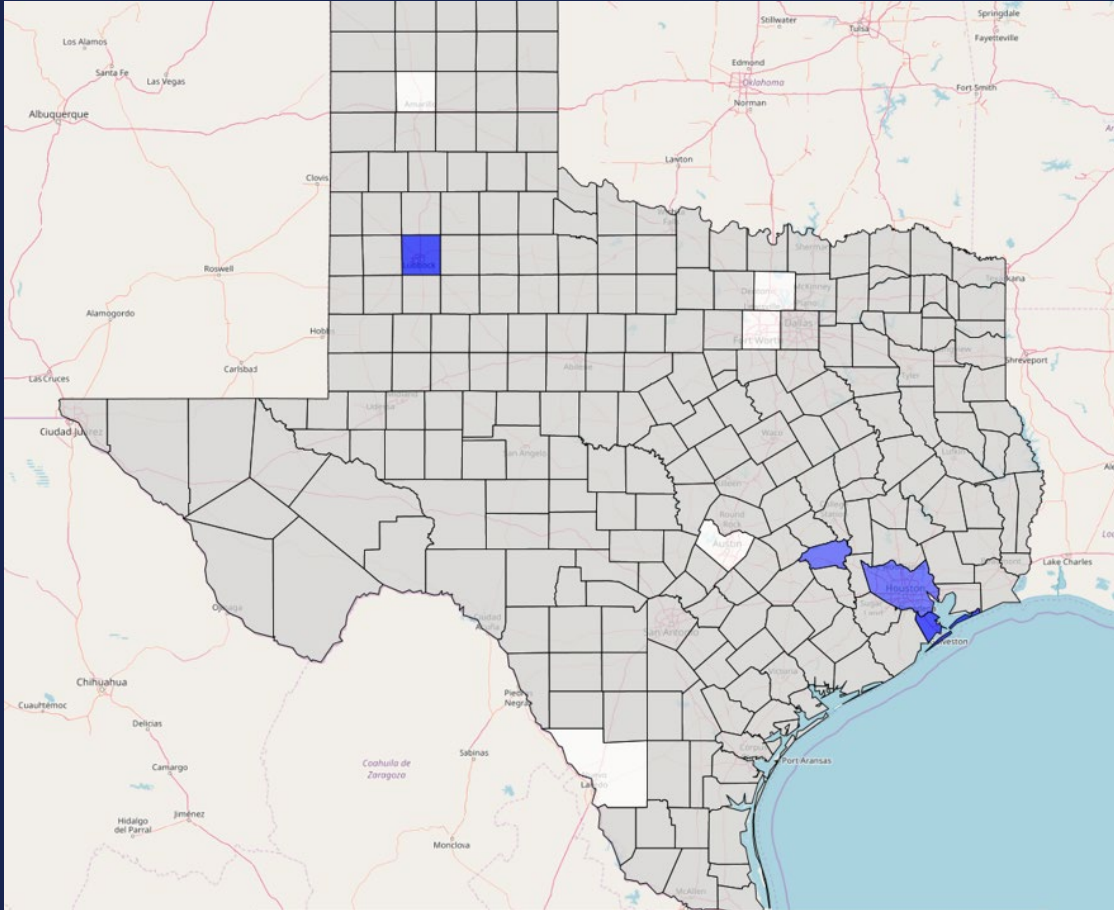


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# High Prevalence



- Total cases of VIM CRPA in Texas

Region 1 with 27

Region 6/5S with 5



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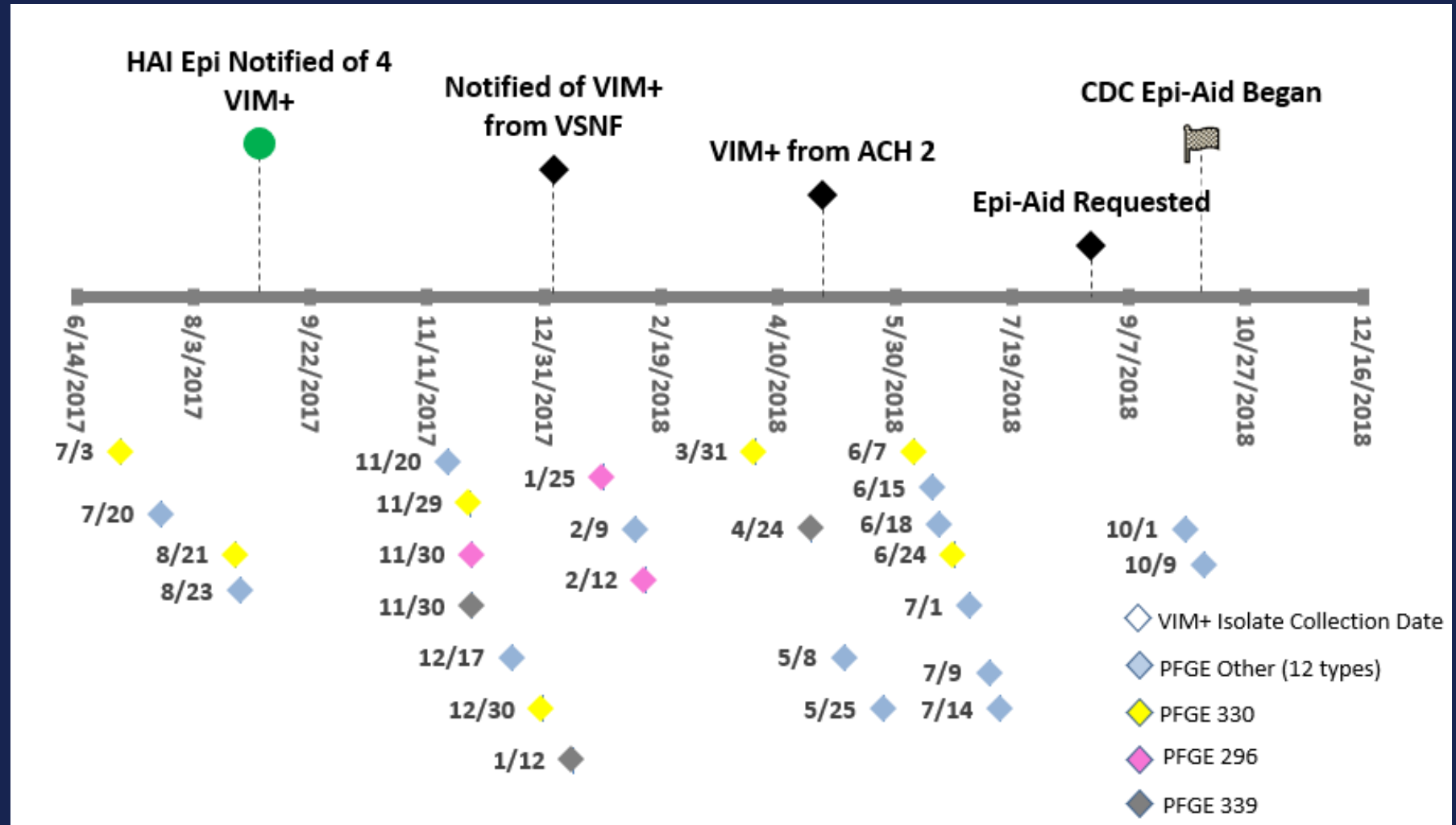
# During the Epi-Aid

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**3 Week Visit from the CDC**

# West Texas VIM CRPA Timeline

## July 2017 – October 2018



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# Epidemic Stages

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- 0 – No cases reported
- 1 – Sporadic occurrence
  - Single cases not epidemiologically related
- 2 – Single facility outbreaks
  - $\geq 2$  epi-linked cases in one facility
- 3 – Regional spread
  - $> 1$  facility cluster within one referral network
- 4 – Interregional spread
  - Multiple clusters occurring within different referral networks
- 5 – Endemic
  - Most facilities are repeatedly seeing cases admitted from unrelated sources



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# The Goal of the Epi-Aid

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## To Develop & Implement Regional Containment Strategy

- Elements of a successful regional strategy:
  - Led by a central public health authority
  - Participation of most or all of facilities in the region
  - Surveillance cultures/screening
  - Inter-facility communication
- Goal: Decrease spread of MDROs in the regional network of facilities

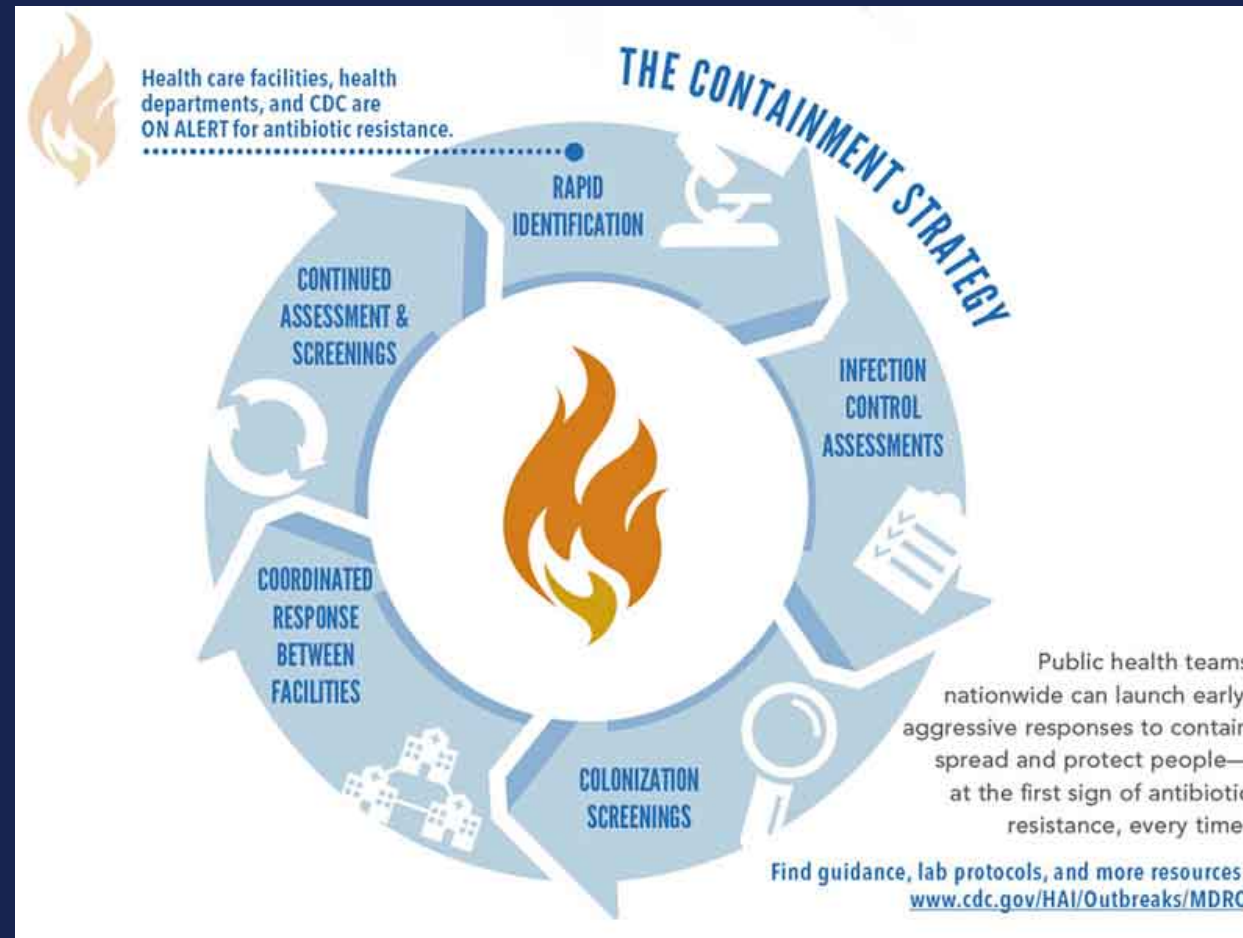


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# The Containment Strategy

Systematic public health response to slow the spread of emerging AR



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# Preparing to Implement a Regional Prevention Strategy

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1. Define the region through referral networks
2. Increase regional awareness of issue
3. Facilitate detection
4. Assess baseline regional prevalence
5. Assess baseline infection control at high risk facilities



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# Onsite Assessments

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- Conducted at 11 healthcare facilities in West Texas
  - 3 short stay acute care hospitals (ACH)
  - 1 long term acute care hospital (LTACH)
  - 1 inpatient rehabilitation facility (IHR)
  - 4 skilled nursing facilities (SNFs)
  - 1 ventilator skilled nursing facility (vSNF)
  - 1 outpatient wound care center

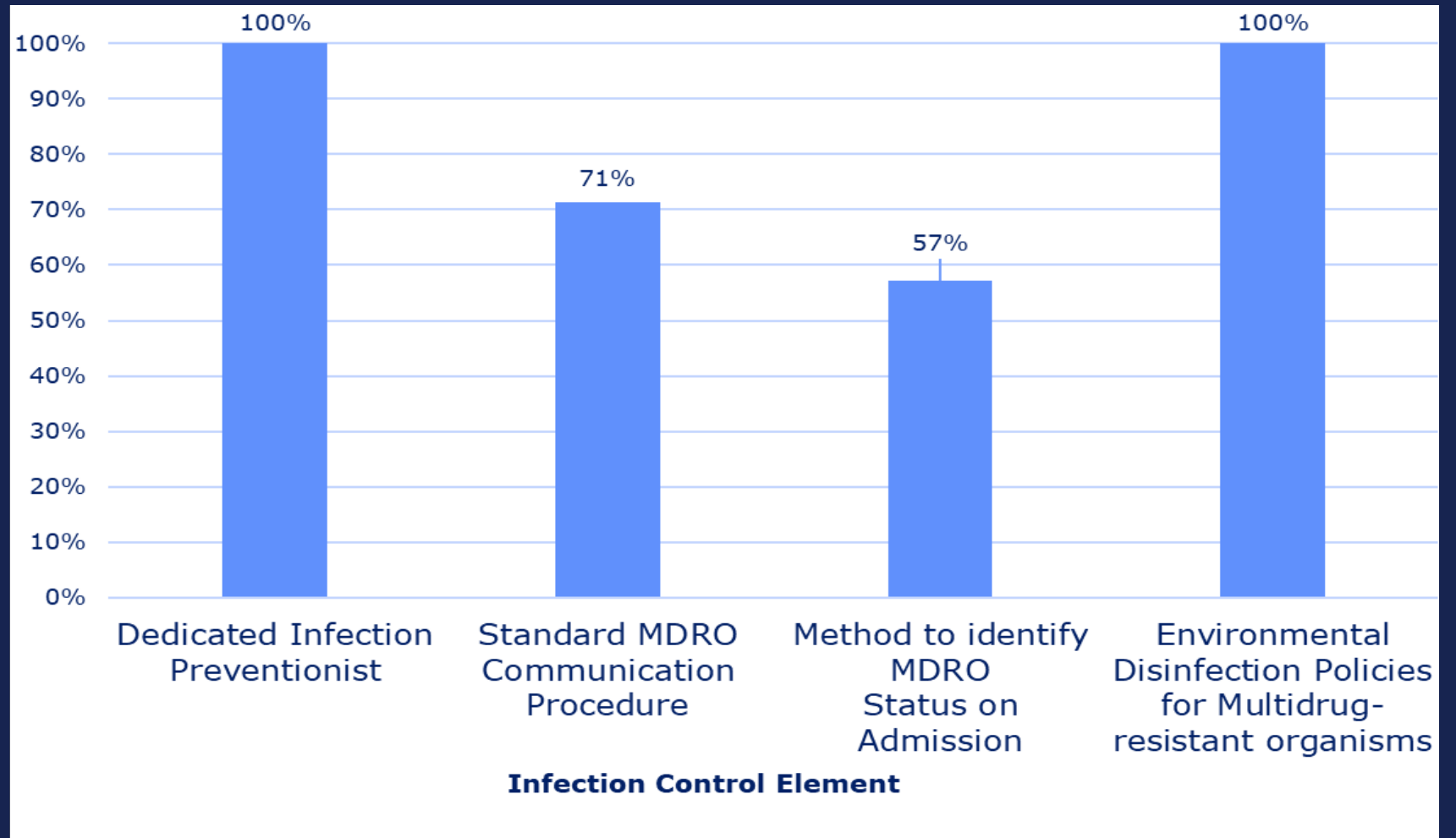


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# Onsite Assessment Results



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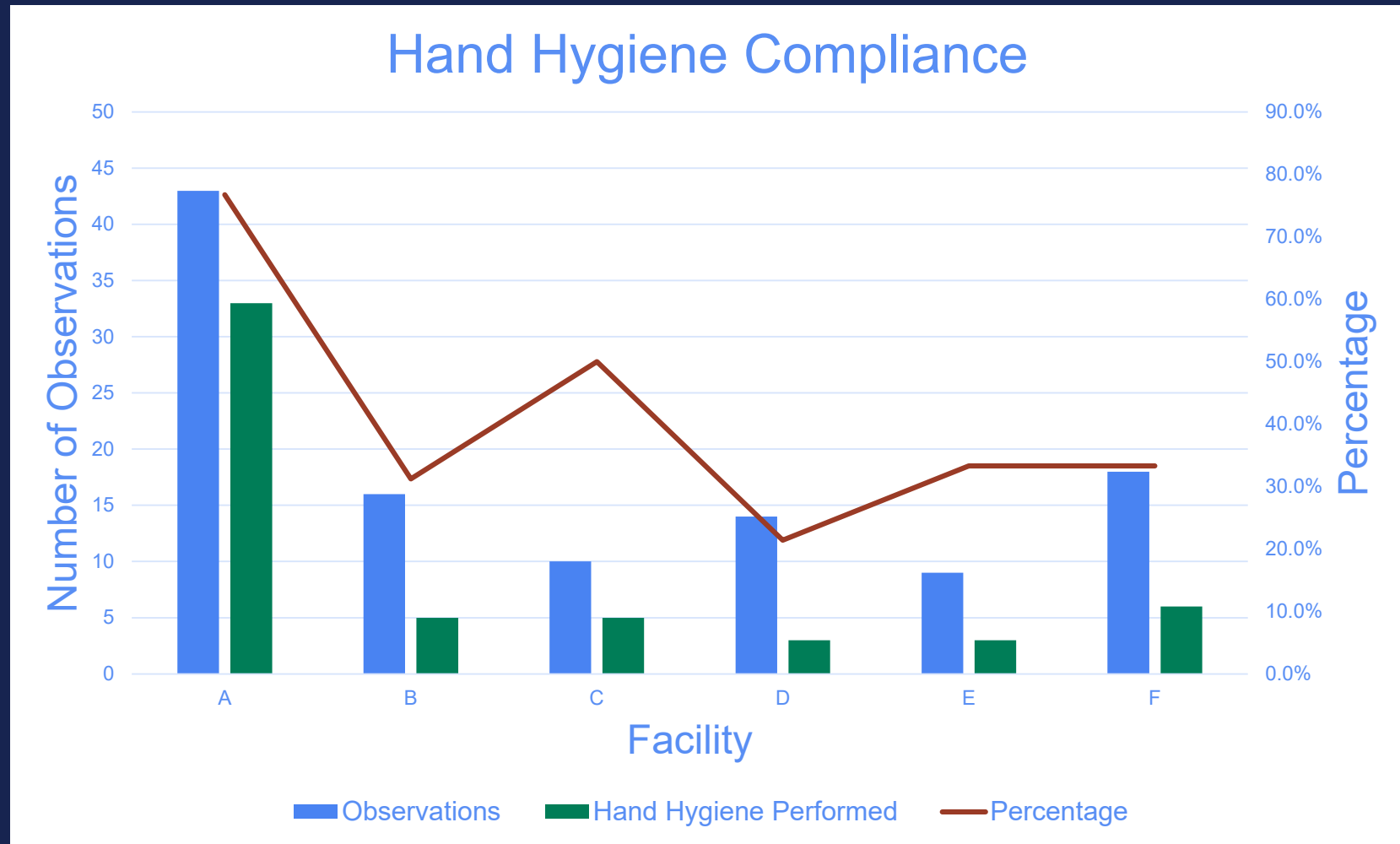
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# Hand Hygiene



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# Environmental Cleaning



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Surface Cleaning Assessment  
with Glo Germ  
(total surfaces assessed = 25/facility)



# Alcohol Based Hand Rub

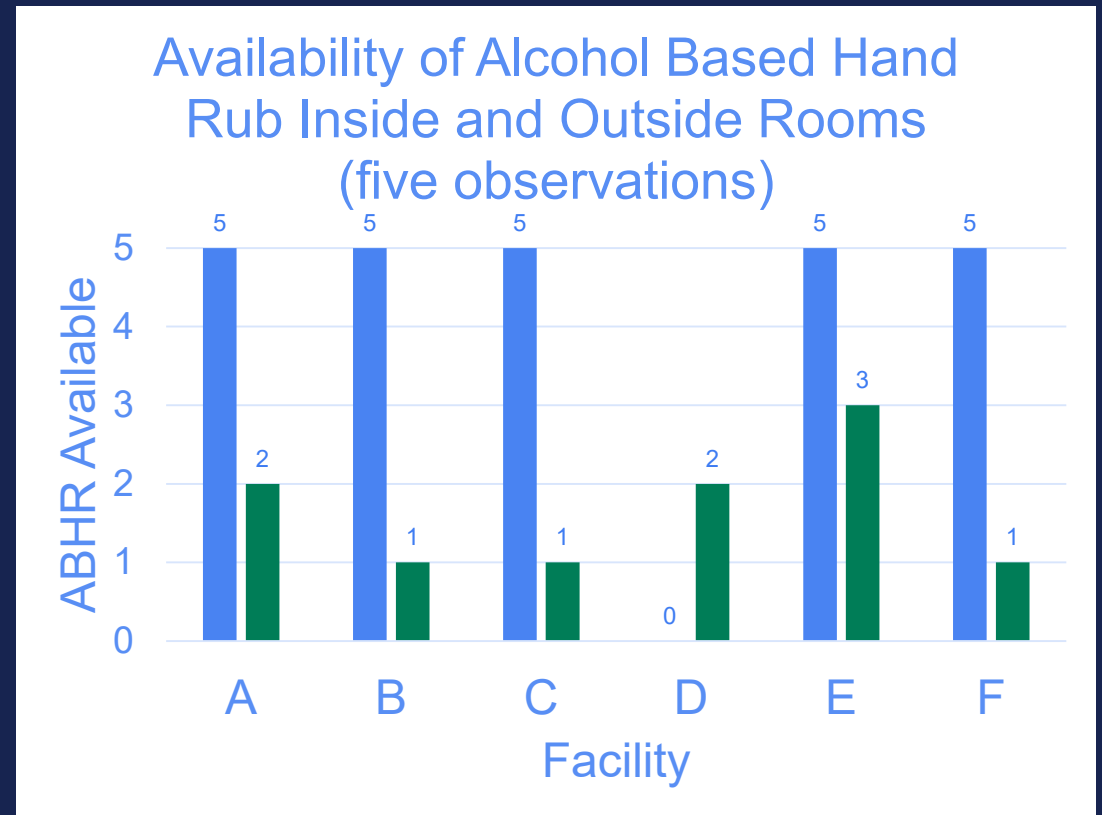
- Few easily accessible ABHR
  - Facilities stated issues with fire code
  - Many unclear what local regulation is





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Inside room   
Outside room 

# Point Prevalence Survey (PPS)

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## Evaluate the presence of CP-MDROs

- Conducted at 6 different facilities
- 261 colonization swabs collected
  - No additional VIM CRPA positives identified
  - 2 Previously unknown KPC +
- 1 facility screened directly after the epi-aid
  - 68 colonization swabs
  - No additional positives



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# PPS Results

Facility	Total Attempted	Tested	%	Findings
A - ACH	50	33	66	0
B - ACH	16	7	44	0
C - LTACH	30	23	77	0
D - vSNF	80	39	49	2 KPC *
E - SNF	55	44	80	0
F - SNF	80	47	59	0
G - SNF	79	68	86	0
<b>Total - 7</b>	<b>390</b>	<b>261</b>	<b>67</b>	<b>2 KPC</b>

\* Previously unknown KPC-CRE



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# Surveillance Cultures

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## Skin/ Wound and Sputum Samples

- 1 acute care facility collected clinical specimens along with the PPS rectal swabs
- From two ICUs
- 34 patients (100%) agreed to skin/wound
- 9 patients (26%) agreed to sputum
- Results – 1 CRPA, 1 CRAB



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# Environmental Sampling

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## Collected due to high *P. aeruginosa* rates at ACHI

- 45 samples collected
- Sites:
  - sinks
  - drains
  - toilets
  - showers
  - water samples
  - patient areas in the burn unit
  - medical ICU
  - emergency department



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# Environmental Sampling Results

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- 27% showed *P. aeruginosa* growth (VIM was detected but not isolated in 3)
- 4 KPC+ CRE
- 2 OXA+ CRAB
- 1 VIM+ *Pseudomonas monteilli*
- 2 First Catch water samples were over the EPA guideline – 1 grew *P. aeruginosa*



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# Whole Genome Sequencing

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## Illumina MiSeq Platform

- 26 investigation related isolates tested
- All were sequence type ST308
- All carried *bla*<sub>VIM-2</sub> gene
- Ranging between 0 – 88 SNPs but majority were very closely related
- The isolates were compared to 5 from Texas and 19 from other states
  - West Texas samples showed to be unique



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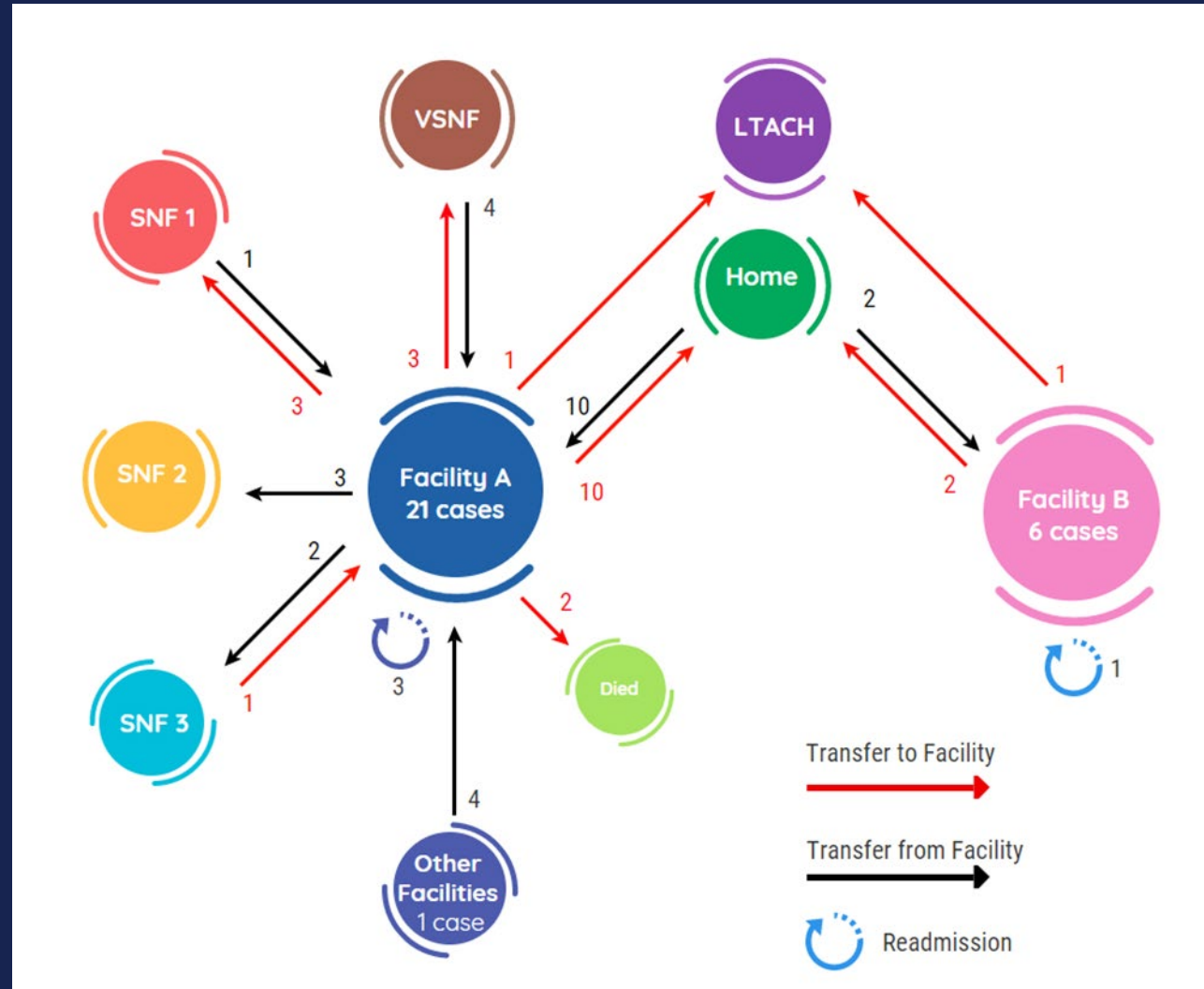


# Connections



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# Educational Resources

## Carbapenem-resistant *Acinetobacter baumannii* (CRAB)



### What is *Acinetobacter baumannii*?

- *A. baumannii* is a bacterium found in soil and is a common contaminant of medical equipment, surfaces and skin. It is a cause of healthcare-associated infections. These infections are common and can lead to severe infection or death.
- *A. baumannii* can become resistant to some of our strongest antibiotics called carbapenems. Examples include imipenem or meropenem. This is called Carbapenem-resistant *A. baumannii* or CRAB.
- This organism can carry any of the 5 plasmid-encoded enzymes of primary public health concern that degrade carbapenems: OXA (oxacillinase) (most common in CRAB), KPC, NDM, IMP, and VIM. Enzymes are also known as resistance mechanisms. CRAB with multiple resistance mechanisms can lead to epidemic spread.
- These organisms can be carried by individuals without causing illness (called asymptomatic carriage). These individuals can spread CRAB to others.
- High-risk patients include those who require medical devices like ventilators, urinary catheters, intravenous catheters, and/or those who are taking long-term courses of antibiotics.
- CRAB can be transmitted from person to person or through shared equipment or healthcare personnel.
- Testing individuals helps prevent spread in a facility and helps their doctor treat them should they become ill.

### Prevention in Healthcare Settings

The Texas Department of State Health Services (DSHS) serves as the Antibiotic Resistance Laboratory Network (ARLN) regional lab for the Mountain Region. In order to understand the occurrence of this organism in your community and prevent further spread of the bacteria, epidemiologists may perform infection control consultations or coordinate the collection of patient samples at healthcare facilities where care was received by patients with CRAB or other resistance mechanisms.



### What can you do?

To prevent the spread, healthcare personnel should follow infection control precautions including:

- Adhering to hand hygiene recommendations
- Carefully cleaning and disinfecting rooms and medical equipment
- Wearing a gown and gloves when performing care of patients/residents that may lead to contamination of healthcare personal hands or clothes (bathing, assisting with toileting) in addition to using standard precautions
- Adhering to guidelines for use of personal protective equipment (PPE) in patients who require transmission-based precautions
- When possible, cohorting individuals and dedicating equipment and staff
- Only prescribing antibiotics when necessary
- Daily cleaning and disinfection of surfaces close to the individual (bed rails, tray table) and other frequently touched surfaces
- Participating in public health initiatives to prevent CRAB from spreading

For more information, please contact the Texas Department of State Health Services (1-888-963-7111) or visit the Centers of Disease Control and Prevention at <https://www.cdc.gov/healthcare/antibiotic-resistance-508.pdf>

## Carbapenem-resistant Enterobacteriaceae (CRE)



### What is Enterobacteriaceae?

- A large family of gram-negative rods including Enterobacter, Klebsiella, and E. coli found in normal gut flora; they are opportunistic pathogens.
- They are the most commonly encountered bacteria in clinical microbiology labs. Infections can lead to severe infection or death. They are difficult to treat because they have high levels of resistance to antibiotics.
- Enterobacteriaceae can become resistant to carbapenem antibiotics (such as imipenem or meropenem) – some of our strongest antibiotics. They can carry any of the 5 plasmid-encoded enzymes of primary public health concern that degrade carbapenems: KPC (most common in US), NDM, VIM, IMP, and OXA. Enzymes are also known as resistance mechanisms. CRE with multiple resistance mechanisms can lead to epidemic spread.
- High-risk patients include those who require medical devices like ventilators (breathing machines), urinary catheters, intravenous catheters, and/or are taking long courses of antibiotics.
- They can be carried on individuals without causing illness (called asymptomatic carriage). These individuals can spread CRE to others or become ill from it.
- Can be transmitted person to person or through shared equipment or healthcare personnel.

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- Participating in public health initiatives to prevent CRE from spreading

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## Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA)



### What is *Pseudomonas aeruginosa*?

- *P. aeruginosa* is bacteria that thrives in moist places like water and soil. It is a leading cause of healthcare-associated infections (CAUTI, CLABSI, VAE). These infections are common and can lead to severe infection or death.
- *P. aeruginosa* can become resistant to some of our strongest antibiotics called carbapenems. Examples include imipenem or meropenem. This is called carbapenem-resistant *P. aeruginosa* or CRPA.
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# Inter-Facility Infection Prevention Transfer Form



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## Inter-Facility Infection Prevention Transfer Form

This form must be filled out for transfer to accepting facility with information communicated prior to or with transfer.

Please attach copies of latest culture reports with susceptibilities if available.

### Sending Healthcare Facility:

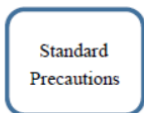
Patient/Resident Last Name	First Name	Date of Birth	Medical Record Number
		__/__/____	

Name of Sending Facility	Phone Number	Address

Sending Facility Contacts	NAME	PHONE	EMAIL
Case Manager/Admin/SW			
Infection Prevention			

### Personal Protective Equipment for Safe Patient Contact and Infection Prevention

Please check what is needed:



Standard



Gown



Gloves



Surgical (Droplet Mask)



Fit-Tested N95

Does patient currently have an infection, colonization OR a history (in the last 12 months) of a positive culture of a multidrug-resistant organism (MDRO) or other organism of epidemiological significance?	History (Last 12 months) Check if YES	Current Check if YES
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)		
Vancomycin-resistant <i>Enterococcus</i> (VRE)		
<i>Clostridium difficile</i>		
<i>Acinetobacter</i> , multidrug-resistant		
<i>E. coli</i> , <i>Klebsiella</i> , <i>Proteus</i> , etc. w/ Extended Spectrum $\beta$ -Lactamase (ESBL)		
Carbapenem-resistant Enterobacteriaceae (CRE)		
Carbapenem-resistant <i>Pseudomonas aeruginosa</i> (CRPA)		
Other:		
Cultures pending:		
<b>SYMPTOMS: Check any that currently apply:</b>		
<input type="checkbox"/> Cough/uncontrolled respiratory secretions <input type="checkbox"/> Incontinent of urine <input type="checkbox"/> Vomiting <input type="checkbox"/> Acute diarrhea or incontinent of stool	<input type="checkbox"/> Draining wounds <input type="checkbox"/> Other uncontained body fluid/drainage <input type="checkbox"/> Concerning rash (e.g. vesicular)	<input type="checkbox"/> None of the symptoms listed present

Person completing form: \_\_\_\_\_  
 Role: \_\_\_\_\_ Date: \_\_/\_\_/\_\_\_\_



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# Next Steps

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**Post 3 week Epi-Aid Visit**



# Follow up

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1. Provide written feedback to facilities
2. Regional Webinar on Containment Strategies
3. Host conference calls check-ups with facilities
4. Regional Containment Kickoff Meeting
5. Educational webinars to address gaps in facilities infection control



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# West Texas gives VIM the B.O.O.T.



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- Kickoff meeting for the implementation of the regional containment strategy
- **B**e prompt (investigate new cases and perform contact screening)
- **O**btain isolates (submit clinical isolates to AR Laboratory Network, conduct active surveillance)
- **O**ptimize Infection Prevention
- **T**ransfer using the regional interfacility notification form – every time!



# Regional Prevention Strategy

1. Detection
  - Continue to recruit submission to ARLN
2. Infection control
  - Return site visits every 6 months
3. Inter-facility notification
  - Implement MDRO Transfer Form
4. Targeted screening in response to cases
5. Active surveillance at high-risk facilities
  - Every other month PPS at facilities involved
  - Begin admission screening at ACH1 and ACH2



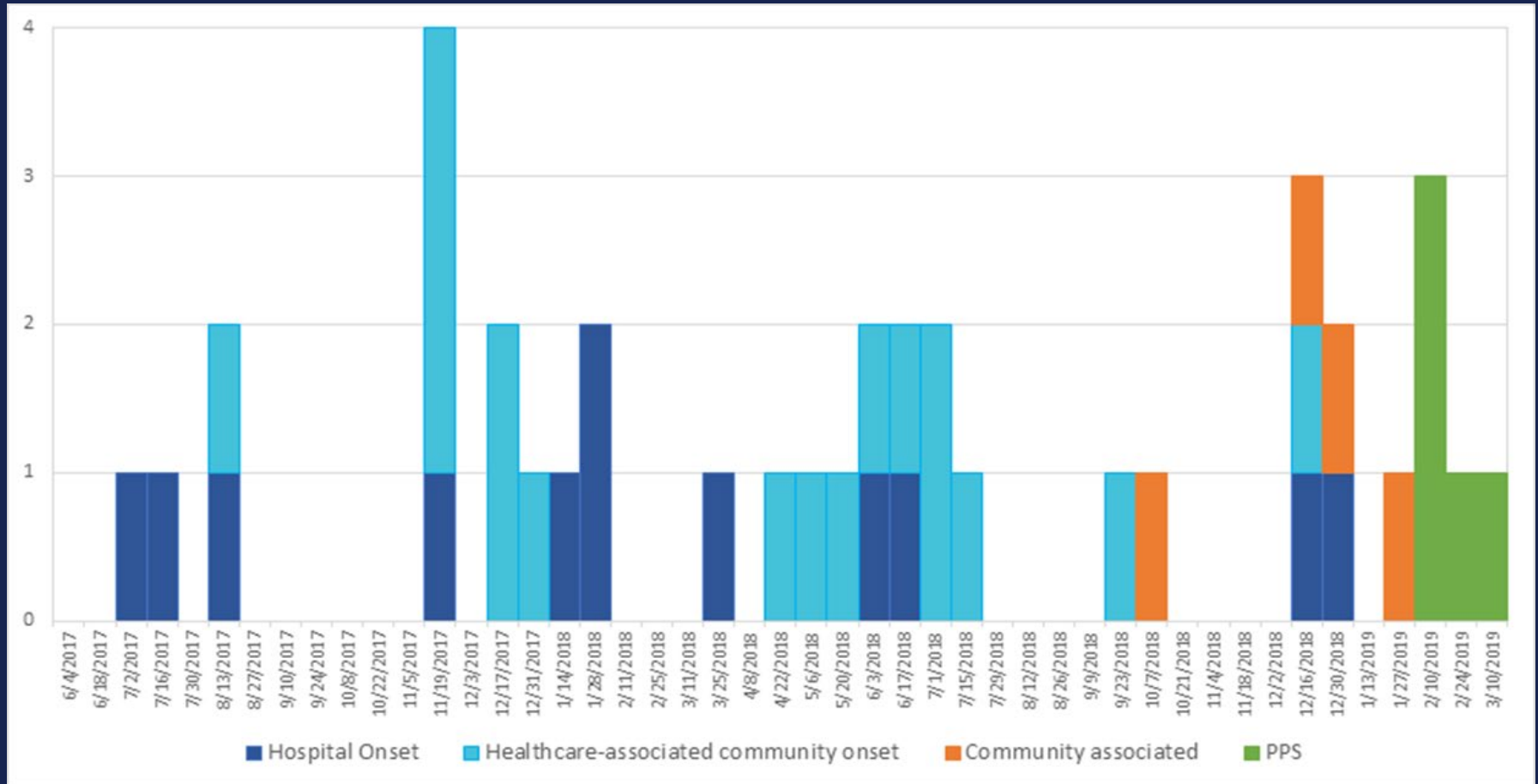
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# Hospital or Community Associated?

Collection dates 6/4/17 - 3/10/19





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# PPS Summary

- Total swabs collected: 751
- Previously unknown VIM+ CRPA: 5
- Previously unknown KPC+ CRE: 2

Date (2019)	PPS#	# Screened	Positives
28-Jan	1	37	2 initial cases
11-Feb	2	80	3
25-Feb	3	75	1
12-Mar	4	78	1
25-Mar	5	77	0
8-Apr	6	78	0
Total	6	425	7



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# Looking into the City Water

- Water samples are going to be collected for testing in May
- Testing will focus on – free residual chlorine, total chlorine, pH and hardness

Facility	Water age range
<b>ACH2</b>	2-5 days
<b>LTACH</b>	2-5 days
<b>SNF</b>	2-5 days
<b>vSNF</b>	2-5 days
<b>SNF</b>	2-5 days
<b>ACH1</b>	5-7 days*
<b>SNF</b>	1-2 days
<b>SSLC</b>	5-7 days
<b>Wound Care Center 1</b>	2-5 days
<b>Wound Care Center 2</b>	2-5 days



# Thank you!

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- Support from Local Health Department
- CDC Epi-Aid Team
- Local LRN
- Texas Antibiotic Resistance Lab Network (ARLN)
- Support from State Health Departments
- Participating Healthcare Facilities



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# Questions or Comments?

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## Contact Information

**TexasARLN@DSHS.Texas.gov**

**MDROTexas@DSHS.Texas.gov**